DISTRIBUTION OF FRESHWATER FISHES IN EAST GIPPSLAND, VICTORIA, 1967–1991

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Distribution maps of freshwater fish species in the three river basins within the East Gippsland region of Victoria were constructed from data recorded at 153 sites surveyed during 1967–1991. Species diversity was high, 19 species of native freshwater fish (83% of the native freshwater species found in all Victorian coastal river basins) having been recorded. The fauna was dominated by diadromous native species (12 species), the majority of these being widespread and abundant. *Anguilla australis, Galaxias maculatus, Retropinna semoni* and *Salmo trutta* were the most widespread fish species, and the last three were the most abundant. Of 14 species of native fish classified as threatened in Victoria, 10 were recorded from East Gippsland, representing 53% of the native species in the region. Most species considered threatened in Victoria had restricted distributions and low abundances in East Gippsland. Five introduced freshwater fish have been recorded from the region but four of them (*Carassius auratus, Cyprinus carpio, Oncorhynchus mykiss* and *Perca fluviatilis*) had restricted distributions. *Salmo trutta* was more widely distributed than the other introduced species but was restricted to the western half of the region. General comments on the distribution of each species are presented, and the need for an increase in coordinated survey effort in the region is recognised.

ACCURATE information about the distribution and abundance of the freshwater fish fauna of Victoria is crucial to the ecologically well-balanced management of the State's aquatic environment and biota, and is also essential in assessing the conservation status of freshwater fish species (Koehn & Morison 1990). Such information, particularly for species of smaller native fish, was sparse until the late 1970s when the results of surveys began to be published (e.g. Tunbridge 1978, Cadwallader 1979, Tunbridge 1983, McCarraher 1986a, b, c, d, Koehn 1986a, b, Brumley et al. 1987, Morison & Anderson 1987, Tunbridge 1988, Tunbridge & Glenane 1988, Hall & Tunbridge 1988, Anderson & Morison 1989, Hall 1989, McKenzie & O'Connor 1989, and Koehn & O'Connor 1990a).

In reviewing the available information on the aquatic fauna and habitat of East Gippsland, Blyth & Jackson (1985) found that much of the region's aquatic habitat had not been adequately surveyed. Nevertheless, the information, although scant, indicated a high species diversity in the native fish fauna. Indeed, Blyth & Jackson (1985) concluded that the region contained comparatively pristine ecosystems of considerable importance as a scientific reference area against which other aquatic habitats in south-eastern Australia could be compared, a conclusion also reached by Macmillan (1990). Yet since 1985, published results of surveys of the region's freshwater fish fauna have been few (Baxter et al. 1989, Hall 1989, Baxter et al. 1991, Koehn et al. 1991), despite continuing exploitation of the region's natural resources; e.g. intensive harvesting of timber resources since the 1960s and especially in recent years (LCC 1985, Department of Conservation, Forests & Lands 1988). Macmillan (1990) noted the limited amount of fish survey work in East Gippsland, and Koehn & Morison (1990) stressed the need for further comprehensive fish surveys in the region.

The fish distribution information from East Gippsland reviewed by Blyth & Jackson (1985) is now incomplete, additional species and range extensions having been recorded since then. In contrast to the opinion of the Office of the Commissioner for the Environment (OCE 1989), the recent compilation of fish distribution data for East Gippsland (DWR 1989) was also found to be incomplete and in part inaccurate.

In this report I present detailed distribution maps and comments on the native and introduced fish species of East Gippsland. In compiling the distribution maps I have relied heavily on published and unpublished information

gathered by many investigators during 1967–1991. A resource document containing detailed historical and current species distribution information in estuarine and freshwater habitats in East Gippsland will be published as part of the Silvicultural Systems Project of the Victorian Department of Conservation and Environment (DCE).

STUDY AREA

In this paper, East Gippsland refers to that part of Victoria containing river basins 20 (Towamba River), 21 (East Gippsland), and 22 (Snowy River) (Fig. 1) as designated by the Australian Water Resources Council (1976). As such, the region is more extensive than that encompassed by the Land Conservation Council's review of East Gippsland (LCC 1985) but is smaller than the area designated as the East Gippsland Forest Management Area (Department of Conservation, Forests & Lands 1988), which includes some of river basin 23, the Tambo River. River basins 20, 21 and 22 are not wholly contained within Victoria, 90%, 25% and 60% respectively of their catchments lying in New South Wales.

The location map of the study area (Fig. 1) shows only the main river systems in each of the three river basins, and consequently does not depict the actual density of watercourses in East Gippsland. Macmillan (1989) has presented a more detailed map of the region's seasonal and perennial streams.

DATA SOURCES AND LIMITATIONS

Detailed distribution information for native and introduced freshwater fish species in East Gippsland was compiled from the following sources: published books and refereed scientific journals (Spencer et al. 1889, Timms 1973, Bell et al. 1980, Tunbridge & Rogan 1981, Blyth & Jackson 1985); unpublished university theses (Chessman 1971, Malcolm 1971, Ramm 1986); technical and management reports (Tunbridge 1983, Baxter 1985, 1986, McCarraher 1986a, Jackson & Koehn 1988, Baxter et al. 1989, Hall

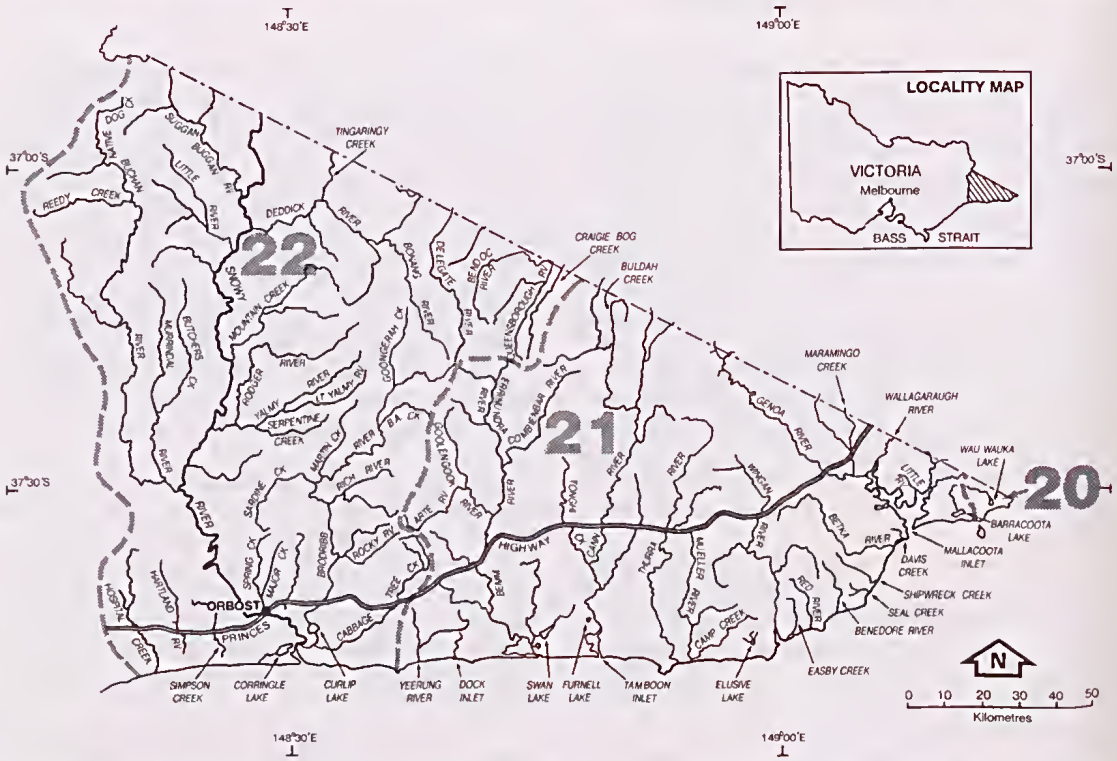

Fig. 1. Map of the East Gippsland region showing the major river systems in the Victorian portions of the Towamba (20), East Gippsland (21) and Snowy (22) river basins.

1989, Barnham 1990, Baxter et al. 1991, Koehn et al. 1991); and other publications (Anon 1974, Dixon 1976, Tunbridge & Glenane 1983). Unpublished information was also obtained from members of the Flora and Fauna and Fisheries Divisions, DCE, and from fish collection data from the Museum of Victoria, Melbourne and the Australian Museum, Sydney. Original data sheets from surveys by Tunbridge (1983) and McCarraher (1986a) were re-examined to collate previously unpublished data. The fish specimen collections from these surveys were also re-identified.

Nomenclature for fish species in the families from Petromyzontidae to Percidae (Table 1) follows Paxton et al. (1989), and for fish species in the families Gadopsidae to Eleotrididae follows Allen (1989).

Because of various limitations in data collected during 1967–1991 (e.g. non-standardised survey methodology, different species targeted and intermittent surveys), records from all surveys over the 24 year period were combined to produce general distribution maps for each species. The distributional information must be treated with caution, as during this period there has been considerable habitat modification in the region which may have changed species distributions and abundances considerably. The maps do, however, accurately reflect the current state of knowledge of the distribution of each species within the region.

SUMMARY OF MAJOR SURVEYS

Intensive inventory surveys of the fish fauna in East Gippsland have been conducted by the DCE. A few investigations which incidentally recorded fish species were conducted by other Government agencies or Universities (see Data Sources).

The first survey of fish assemblages in East Gippsland was a single, low intensity survey conducted in 1967 at two sites on the Combienbar River and at one site on the Cann River (B. R. Tunbridge, DCE, unpubl. data).

A limited survey at four sites in the upper Buchan and Suggan Buggan rivers during February 1974 was conducted by the then Fisheries and Wildlife Department (Dixon 1976; B. R. Tunbridge, DCE, pers. comm. 1991). In 1976 intensive netting surveys of estuarine and freshwater habitats at lower altitudes were started to determine the distribution of populations of commercially and recreationally exploited species. These surveys continued until 1983 but the distribution of smaller native fishes or of freshwater species in general was given little attention (McCarraher 1986a).

A survey involving sampling with the ichthyocide rotenone was conducted in the newly created Snowy River National Park in 1980, at two sites on the Snowy River and at one site each on the Deddick and Suggan Buggan rivers (B. R. Tunbridge, DCE, unpubl. data). Streams in the Croajingolong National Park were surveyed by mesh netting and rotenone sampling between 1980 and 1983, at 41 sites mostly in estuarine and low elevation fresh water habitats (Tunbridge 1983).

Low intensity surveys for commercially and recreationally exploited species were conducted in freshwater and estuarine habitats intermittently during 1979–1990 using mesh nets and rotenone (Baxter 1985, Baxter et al. 1989, 1991), and at four sites within the Croajingolong National Park in 1986 using electrofishing (B. R. Tunbridge, DCE, unpubl. data). A brief electrofishing survey of 31 freshwater sites in river basins 21 and 22 was conducted in 1988 (Koehn et al. 1991).

A survey conducted during February 1991 involved electrofishing and mesh netting at 18 sites in freshwater and estuarine habitats in the east of the East Gippsland river basin (S. R. Saddlier, DCE, unpubl. data). A further intensive survey of 23 sites in the Martins Creek Forest Block (Martin Creek/Brodribb River system) was conducted using electrofishing during May 1991 (S. R. Saddlier, DCE, unpubl. data).

The methods used to capture freshwater fish during 1967–1991 varied considerably. The use of rotenone was the main method utilised during earlier surveys, whereas electrofishing in shallow streams, and fyke and gill netting in deeper sections, were employed in later surveys. There were differences also in the capture efficiencies of the electrofisher units used in different surveys (see Koehn & McKenzie 1985).

The timing of the surveys has important implications in the apparent distribution and abundance of diadromous species. Surveys were conducted throughout most months of the year but the majority from late winter to late autumn (August though to May). This period includes the time of maximum diversity of diadromous species in freshwater habitats, during summer to early autumn (Koehn & O'Connor 1990b).

Family	Scientific name	Common name
NATIVE SPECIES		
PETROMYZONTIDAE	*Geotria australis* Gray, 1851	pouched lamprey
	Mordacia mordax (Richardson, 1846)	short-headed lamprey
ANGUILLIDAE	*Anguilla australis* Richardson, 1841	short-finned eel
	Anguilla reinhardtii Steindachner, 1867	long-finned eel
CLUPEIDAE	*Potamalosa richmondia* (Macleay, 1879)	freshwater herring
RETROPINNIDAE	*Retropinna semoni* (Weber, 1895)	Australian smelt
PROTOTROCTIDAE	*Prototroctes maraena* Günther, 1864	Australian grayling
GALAXIIDAE	*Galaxias brevipinnis* Günther, 1866	broad-finned galaxias
	Galaxias maculatus (Jenyns, 1842)	common galaxias
	Galaxias olidus Günther, 1866	mountain galaxias
	Galaxias truttaceus Valenciennes, 1846	spotted galaxias
PERCICHTHYIDAE	*Macquaria novemaculeata* (Steindachner, 1866)	Australian bass
KUHLIIDAE	*Nannoperca australis* Günther, 1861	southern pigmy perch
GADOPSIDAE	*Gadopsis marmoratus* Richardson, 1848	river blackfish
BOVICHTHYIDAE	*Pseudaphritis urvillii* (Valenciennes, 1831)	tupong
ELEOTRIDIDAE	*Gobiomorphus australis* (Krefft, 1864)	striped gudgeon
	Gobiomorphus coxii (Krefft, 1864)	Cox's gudgeon
	Philypnodon grandiceps (Krefft, 1864)	flat-headed gudgeon
	Philypnodon sp. nov.	dwarf flat-headed gudgeon
INTRODUCED SPECIES		
SALMONIDAE	*Oncorhynchus mykiss* (Walbaum, 1792)	rainbow trout
	Salmo trutta Linnaeus, 1758	brown trout
CYPRINIDAE	*Carassius auratus* (Linnaeus, 1758)	goldfish
	Cyprinus carpio Linnaeus, 1758	carp
PERCIDAE	*Perca fluviatilis* Linnaeus, 1758	redfin

Table 1. Scientific and common names of freshwater fish species recorded from East Gippsland during 1967–1991.

SURVEY SITES

Freshwater fish species have been recorded from 153 sites (Fig. 2) for which location data were available (see Appendix). Of these sites, 114 were located in freshwater reaches of streams and 39 in estuarine habitats. Many of the freshwater fish species in East Gippsland are diadromous and spend part of their lives in estuaries. Some species tolerate a wide range of salinity and are found naturally throughout the year in habitats ranging from estuarine to freshwater (Hart et al. 1989).

The number of freshwater survey sites for fish in East Gippsland is very small; by comparison, Jackson & Davies (1983) surveyed 115 sites in the Grampians region in an area 15% the size of East Gippsland, and Cadwallader (1979) surveyed 60 sites in one river system (Seven Creeks). Furthermore, most of the sites surveyed in East Gippsland are within the Snowy River and East Gippsland river basins; only one site (Lake Wau Wauka) has been surveyed in the Towamba River basin (McCarraher 1986a), and on one occassion.

FISH DISTRIBUTIONS

In contrast to other fish inventory surveys (Pusey et al. 1989, Hayes et al. 1989), the lack of standardised survey methodology between sites in East Gippsland, the low number of sites in specific river systems and the 24 year period over which the data were collected preclude analysis of the spatial variation in fish assemblages within or between river systems. Consequently, comments only on the gross distribution patterns of the freshwater fish species recorded from the three river basins (Table 1, Figs 3–9) are provided in the following sections.

Blyth & Jackson (1985) recorded 16 species of native and 3 species of exotic freshwater fish from East Gippsland; to these can now be added the native species *Geotria australis* (pouched lamprey), *Gobiomorphus coxii* (Cox's gudgeon) and *Philypnodon* sp. nov. (dwarf flat-headed gudgeon), and the exotic species *Perca fluviatilis* (redfin) and *Carassius auratus* (goldfish).

Congeneric species of *Anguilla* (Fig. 4), *Gobiomorphus* (Fig. 8) and *Philypnodon* (Fig. 8) were

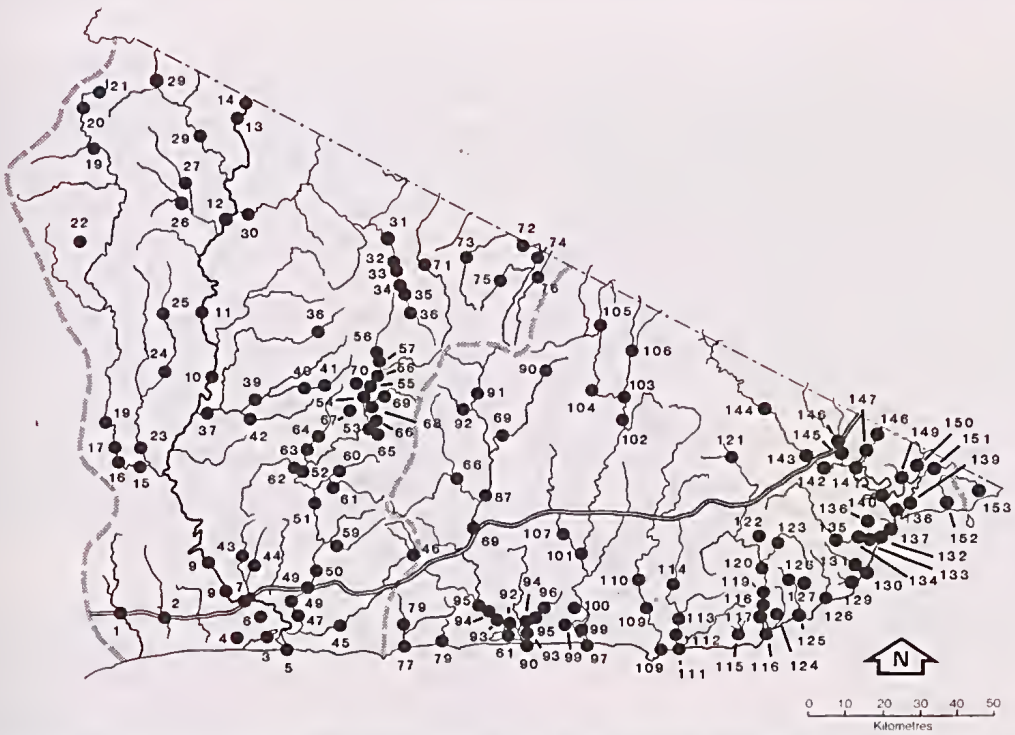

Fig. 2. Location map of survey sites for freshwater fish in East Gippsland during 1967–1991.

Species	No. of Sites	Abundance (No. of individuals)	Altitudinal Range (m)
Anguilla australis	78	115	0–1160
Pseudaphritis urvillii	68	446	0– 620
Galaxias maculatus	66	2736	0– 370
Anguilla reinhardtii	63	283	0– 320
Retropinna semoni	49	2008	0– 760
Salmo trutta	46	1049	0–1160
Philypnodon grandiceps	41	304	0– 370
Gadopsis marmoratus	39	279	10– 960
Macquaria novemaculeata	23	34	0– 200
Prototroctes maraena	20	80	0– 370
Nannoperca australis	16	136	0– 60
Mordacia mordax	16	275	30– 240
Galaxias brevipinnis	15	27	5– 320
Galaxias olidus	10	73	70–1320
Philypnodon sp. nov.	7	73	0– 20
Gobiomorphus australis	6	61	0– 50
Geotria australis	6	56	90– 220
Oncorhynchus mykiss	5	22	0– 840
Galaxias truttaceus	5	6	0– 100
Perca fluviatilis	3	5	720– 800
Gobiomorphus coxii	3	6	5– 50
Carassius auratus	2	11	6– 210
Potamalosa richmondia	1	1	0
Cyprinus carpio	1	?	0

Table 2. Occurrence, abundance and altitudinal range of freshwater fish species recorded from East Gippsland during 1967–1991.

found to occur sympatrically at many sites, as were the two monotypic genera *Geotria* and *Mordacia* (Fig. 3). The distribution of the four *Galaxias* species was less clear. At some sites *Galaxias maculatus* (common galaxias) occurred with one of the other three species, but *G. brevipinnis (broad-finned galaxias), G. olidus* (mountain galaxias) and *G. truttaceus* (spotted galaxias) occurred together only at one site (Wingan River, Fig. 6), where *G. maculatus* was also present. No native fish species are endemic to the region although five are restricted to Victorian coastal streams east of Wilsons Promontory: *Anguilla reinhardtii* (long-finned eel), *Potamalosa richmondia* (freshwater herring), *Macquaria novemaculeata* (Australian bass), *Gobiomorphus australis* (striped gudgeon) and *Gobiomorphus coxii* . A further three species are endemic to southern south-eastern Australia (Allen 1989): *Mordacia mordax* (short-headed lamprey), *Galaxias brevipinnis* and *Pseudaphritis urvillii* (tupong).

Native fish species

Geotria australis (pouched lamprey; Fig. 3). In Australia *G. australis* is a nocturnal species inhabiting streams at low to high elevations (Merrick & Schmida 1984). Adults are rarely caught though downsteam migrants and ammocoetes may be seasonably abundant. In East Gippsland the distribution of the species is restricted and patchy (Table 2). The five sites found during an intensive survey of Martin Creek and Brodribb River in 1991 (S. R. Saddlier, DCE, unpubl. data) suggest that *G. australis* may be more widely distributed than previously thought, at least within the Snowy River basin. Past surveys may have misidentified *G. australis* ammocoetes as *Mordacia mordax*.

The Brodribb River is the most easterly extent of the recorded range for this species in Australia and represents a range extension. Previously, Paxton et al. (1989) recorded *G. australia* only as far east as Lake King, Gippsland.

Mordacia mordax (short-headed lamprey; Fig. 3). This species is nocturnal and commonly found as ammocoetes and adults in streams at low to high elevations (Merrick & Schmida 1984). In the Snowy River and East Gippsland basins it has been recorded from 16 sites at low to middle altitudes (Table 2). East Gippsland

Fig. 3. Distribution of *Geotria australis* (■) and *Mordacia mordax* (●) in East Gippsland during 1967–1991. (♦) = both species.

Fig. 4. Distribution of *Anguilla australis* (●) and *Anguilla reinhardtii* (■) in East Gippsland during 1967–1991. (♦) = both species.

falls within the middle of the geographieal range of the speeies in Australia.

Angnilla australis (short-finned eel) and *Angnilla reinhardtii* (long-finned eel) (Fig. 4). Both these speeies were reeorded from all three river basins and are eommon and widespread in East Gippsland where *A. australis* is the most widespread of all fish speeies, oeeurring at 78 sites (Table 2). *A. reinhardtii* was the fourth most widespread speeies (63 sites) and was found at low to middle elevations, whereas *A. australis* ranged higher into subalpine areas. Both speeies range northward along the New South Wales eoast and westward aeross southern Vietoria (Merriek & Schmida 1984). Survey data to support the reeord of *A. anstralis* from the Murrindal River by Tunbridge & Rogan (1981) were not located.

Potamalosa richmondia (freshwater herring; Fig. 5). One speeimen of *P. richmondia* was eolleeted together with 14 speeimens of *Herklotsichthys castelnani* (southern herring) from Little River, Mallaeoota Inlet in 1976. In the published report of the survey (MeCarraher 1986a) the speeimens of southern herring were ineorreetly listed as freshwater herring. Other reeords of *P. richmondia* in Vietoria (Cadwallader & Baekhouse 1983) have not been substantiated. Paxton et al. (1989) reeorded this speeies as far to the south-west as Lakes Entranee but survey data to support this reeord were not loeated. Elsewhere in Australia *P. richmondia* is distributed from estuarine environments to headwater streams (Pidgeon 1989).

Prototroctes maraena (Australian grayling; Fig. 5). This diadromous speeies ean penetrate well inland from eoastal areas if instream aeeess is unrestricted (e.g. Craigie Bog Creek and Combienbar River, Fig. 5). *P. maraena* is patehily distributed in East Gippsland, having been reeorded at 20 sites from low to middle elevations (Table 2) in two of the three river basins. Clear-flowing, gravel substrate streams suitable for *P. maraena* (see Jaekson & Koehn 1988) do not appear to be present in the Vietorian portion of the Towamba River basin.

Retropinna semoni (Australian smelt; Fig. 5). This salt-tolerant, non-diadromous speeies is the fifth most widely distributed speeies in East Gippsland, being found from low to high elevations and from all three river basins. The speeies

Fig. 5. Distribution of *Potamalosa richmondia* (♦), *Prototroctes maraena* (▲), *Nannoperca australis* (■) and *Retropinna semoni* (●) in East Gippsland during 1967–1991.

was recorded from 49 sites (Table 2), commonly in abundance.

Galaxias brevipinnis (broad-finned galaxias; Fig. 6). The distribution of this diadromous species is patchy throughout the Snowy River and East Gippsland river basins (15 sites), ranging from low to middle elevations (Table 2). The patchiness of the distribution probably reflects gaps in our knowledge rather than a restricted range in East Gippsland. The distribution in East Gippsland may extend also into upland areas as *G. brevipinnis* has been found elsewhere at high elevations (McDowall & Frankenberg 1981, Koehn & O'Connor 1990a). *G. brevipinnis* has been recorded from the New South Wales portions of the Genoa River (Llewellyn 1983), Wallagaraugh River (T. A. Raadik, DCE, unpubl. data) and upper Snowy River (McDowall & Frankenberg 1981), so that the species may also be considered present in the Victorian portions of these streams.

Galaxias maculatus (common galaxias; Fig. 6). This is the third most widespread species in East Gippsland, occurring at 66 sites ranging from sea level to middle elevations (Table 2). It is the only galaxiid species to be recorded from all three river basins and is a ubiquitous species in Victorian coastal streams. It is found elsewhwere only at low elevations close to the coast (Cadwallader & Backhouse 1983).

Galaxias olidus (mountain galaxias; Fig. 6). In Australia this non-diadromous species is generally distributed from near sea level up to 1800 m (McDowall & Frankenberg 1981). In East Gippsland *G. olidus* is patchy in distribution, having been recorded from only 10 sites at low to high elevations (Table 2). Such patchiness may reflect gaps in our knowledge. Previously Blyth & Jackson (1985) recorded *G. olidus* in East Gippsland only from the Suggan Buggan River.

Galaxias truttaceus (spotted galaxias; Fig. 6). In East Gippsland this diadromous species has been recorded from the Snowy River and East Gippsland basins (Table 2) but only at five sites at low elevations, although it is common at low to middle elevations elsewhere in Australia (McDowall & Frankenberg 1981). Paxton et al. (1989) recorded *G. truttaceus* extending as far east as Wilsons Promontory, so that the range of

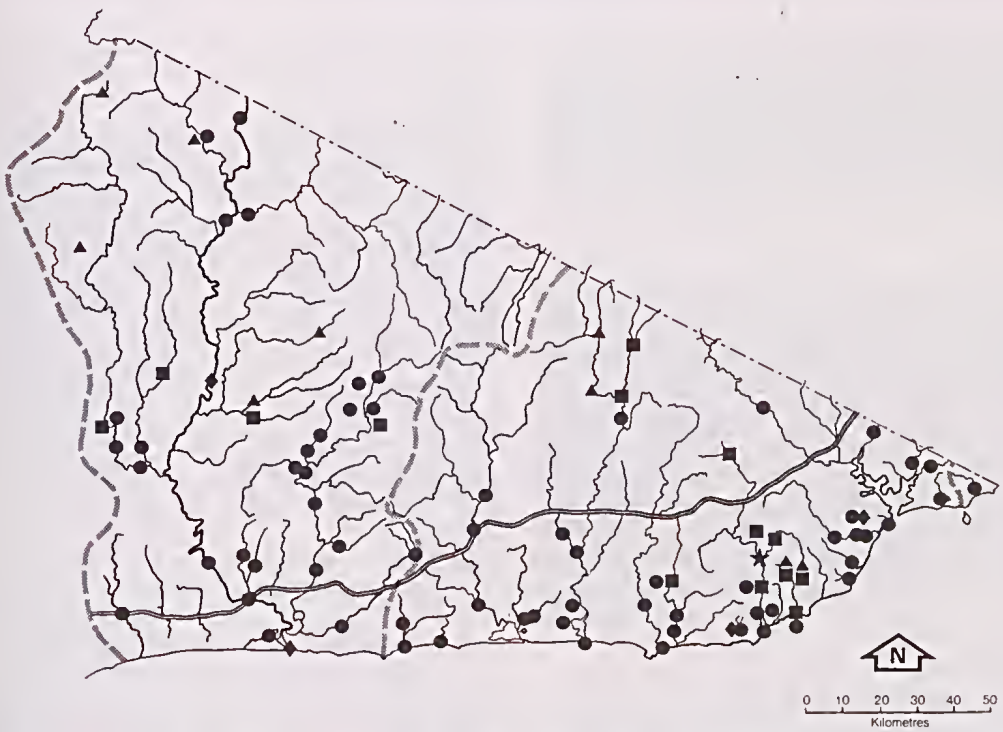

Fig. 6. Distribution of *Galaxias brevipinnis* (■), *Galaxias maculatus* (●), *Galaxias olidus* (▲) and *Galaxias truttaceus* (♦) in East Gippsland during 1967–1991. (★) = all four species.

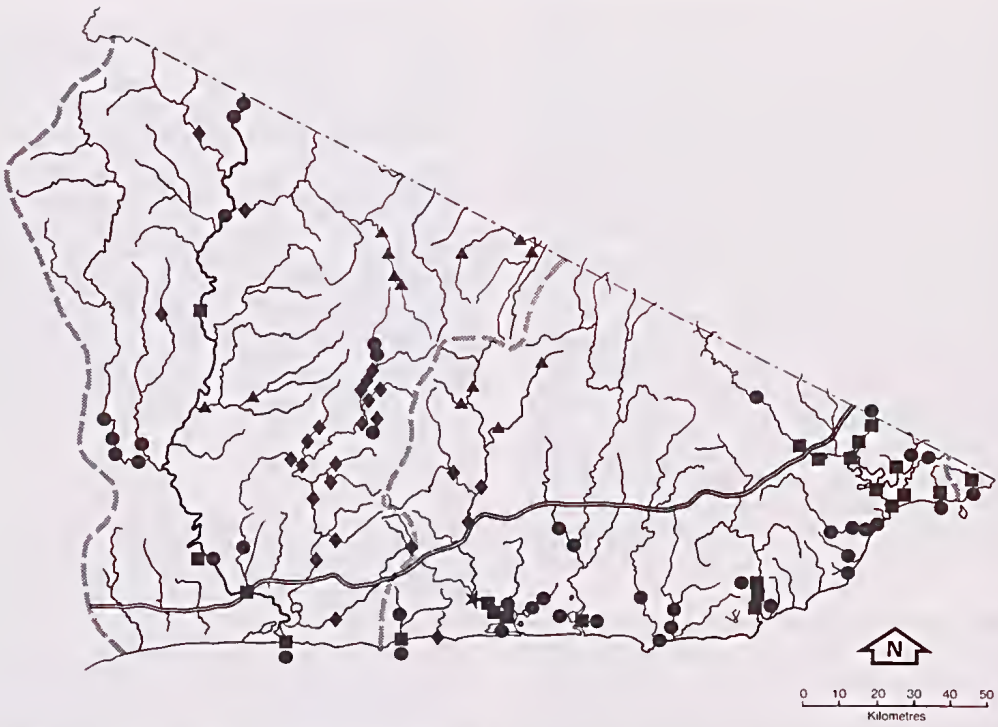

Fig. 7. Distribution of *Macquaria novemaculeata* (■), *Gadopsis marmoratus* (▲) and *Pseudaphritis urvillii* (●) in East Gippsland during 1967–1991. (♦) = G. *marmoratus* and *P. urvillii*, (★) = all three species.

the species should be amended to include all the Victorian coastal river basins in East Gippsland except basin 20. The most easterly known occurrence of *G. truttaceous* in Australia is in Sheep Station Creek (Betka River system, Fig. 1) but the species may extend into southern coastal New South Wales.

Macquaria novemaculeata (Australian bass; Fig. 7). In East Gippsland *M. novemaculeata* was recorded from 23 sites (ninth most widespread species) from low to middle elevations (Table 2). Elsewhere this species has been recorded from low to high elevations (Harris 1985), with males remaining in estuarine and lowland habitats after spawning and females predominating in lagoons or upland lotic habitats (Harris 1987). The lack of collection information for *M. novemaculeata* from middle to high elevations in the Snowy River and East Gipsland basins may be due to the species' seasonal abundance in freshwater, coupled with a lack of surveys in specific areas.

Survey data to support the records of this species by Tunbridge & Rogan (1981) from Thurra Swamp, Buchan River and the Brodribb River below and above the Princes Highway were not located.

Nannoperca australis (southern pygmy perch; Fig. 5). This species is distributed patchily (16 sites) throughout lowland East Gippsland (Table 2), though it has been found at middle elevations elsewhere in Victoria (Cadwallader 1979, Jackson & Davies 1983). *N. australis* prefers weedy, slow-flowing waters and therefore may be more widely distributed in the Snowy River and East Gippsland basins where available habitat exists. Maramingo Creek represents an eastward range extension for this species in coastal Victoria. Blyth & Jackson (1985) listed *N. australis* as occurring in the Red River but survey data to support this record were not located.

Gadopsis marmoratus (river blackfish; Fig. 7). This non-diadromous species is distributed widely throughout the Snowy River basin and extends eastward to the Bemm River system. It is the eighth most widely distributed species, being recorded from 39 sites from low to high altitudes (Table 2). It has not been recorded from the coastal river basins in southern New

Fig. 8. Distribution of *Gobiomorphus australis* (■), *Gobiomorphus coxii* (♦), *Philypnodon grandiceps* (●) and *Philypnodon* sp. nov. (▲) in East Gippsland during 1967–1991.

South Wales (Llewellyn 1983, Allen 1989). Survey data to support the records of this species by Tunbridge & Rogan (1981) from the Little, Buchan and Murrindal rivers in the Snowy River system were not located.

G. marmoratus may be quite common within river systems in East Gippsland, as indicated by its presence in the Martin Creek and Brodribb River system in early 1991 (S. R. Saddlier, DCE, unpubl. data). Spencer et al. (1889) recorded *G. marmoratus* from Cabbage Tree Creek, from where it was most recently collected in 1989 (Koehn et al. 1991).

Pseudaphritis urvillii (tupong; Fig. 7). This species, the second most widely distributed in East Gippsland (68 sites), has been found from estuaries to the upper reaches of streams (Table 2) in all three river basins, and ranges farther eastward into the southern coastal drainages of New South Wales near Bega (Allen 1989).

Gobiomorphus australis (striped gudgeon; Fig. 8). This species appears to be restricted to coastal streams at low elevations. It has been recorded from only six sites in the Snowy River and East Gippsland basins (Table 2) but was abundant and widespread in the Betka River in 1991 (S. R. Saddlier, DCE, unpubl. data). Elsewhere in Australia *G. australis* may be seasonally abundant and is more common at low elevations (Hoese et al. 1980). Cadwallader & Backhouse (1983) recorded this species from the lower Snowy River but survey data to support this record were not located.

Gobiomorphus coxii (Cox's gudgeon; Fig. 8). In East Gippsland this species is restricted to basin 21 (East Gippsland) where it has been recorded from only three sites at low elevations (Table 2), though elsewhere it is known to penetrate well inland to altitudes of 700 m. Further, *G. coxii* is often found in swiftly flowing streams and is rarely found at low altitudes near the ocean (Hoese et al. 1980). The distribution of *G. coxii* in Australia extends as far west as the Franklin River, South Gippsland (Cadwallader & Backhouse 1983).

Philypnodon grandiceps (flat-headed gudgeon; Fig. 8). This salt-tolerant, non-diadromous fish is the seventh most widely distributed species, ranging along coastal areas of East Gippsland

(41 sites) throughout the three river basins from low to middle altitudes (Table 2). Elsewhere in Victoria, *P. grandiceps* is often locally abundant (Cadwallader & Backhouse, 1983).

Philypnodon sp. nov. (dwarf flat-headed gudgeon; Fig. 8). This taxon was first recognised as being distinct from the closely related *Philypnodon grandiceps* by Hoese et al. (1980) but has remained formally undescribed. *Philypnodon* sp. nov. was first recorded from East Gippsland in 1972 when 56 individuals were collected from a tributary of the Snowy River (Department of Ichthyology, Australian Museum, Sydney, AMS I.16969–17006). Further records from East Gippsland are scarce as little attempt has been made to distinguish this species from *P. grandiceps*.

Philypnodon sp. nov. is salt-tolerant and non-diadromous, and has been found from estuaries to elevations of a few hundred metres (Hoese et al. 1980). In East Gippsland specimens have been recorded from seven sites, all at low elevations (Table 2), but it is possible that some records of *P. grandiceps* from the region refer to *Philypnodon* sp. nov. It is regrettable that very few specimens from previous surveys were retained, as correct identifications could have been made retrospectively. *Philypnodon* sp. nov. may therefore be more widespead and abundant in all three river basins.

Introduced fish species

Oncorhynchus mykiss (rainbow trout; Fig. 9). A total of 268,990 individuals of *O. mykiss* were stocked into nine waters in the Snowy River basin between 1908 and 1969 (Barnham 1990). At present the species is confined to five sites in the Snowy River basin (Table 2), where specimens were recently recorded from the lower Snowy and Brodribb rivers and from the Bonang and Queensborough river systems. *O. mykiss* may have established self-sustaining populations in only a few higher altitude streams, with occassional specimens venturing downstream. Survey data to support records of this species from the Brodribb, Delegate, Snowy, Errinundra, Bemm and Combienbar rivers (Tunbridge & Rogan 1981) and from the Thurra and Cann rivers (Blyth & Jackson 1985) were not located. The population of *O. mykiss* in Beadle Lake has not been maintained by stockings since 1964.

Fig. 9. Distribution of *Salmo trutta* (●), *Oncorhynchus mykiss* (▲), *Carassius auratus* (▼), *Cyprinus carpio* (■) and *Perca fluviatilis* (♦) in East Gippsland during 1967–1991.

Salmo trutta (brown trout; Fig. 9). A total of 160,885 individuals of this species were stocked into 13 waters in the Snowy River and East Gippsland river basins between 1889 and 1980 (Barnham 1990), and viable, self-sustaining populations are present throughout the Snowy River basin. *S. trutta*, the sixth most widely distributed species in East Gippsland (46 sites) ranges from low to high altitudes (Table 2) and eastward as far as the Bemm River system. Information from current surveys does not indicate whether the species is expanding its range farther eastward. Viable populations may be established in the Thurra River, and a single specimen was recently collected in the lower Wingan River (S. R. Saddlier, DCE, unpubl. data). Survey data were not located to support the records of this species from the Murrindal and Cann rivers and from below the falls at Sydenham Inlet (Tunbridge & Rogan 1981), and from the upper Thurra River (Blyth & Jackson 1985).

Carassius auratus (goldfish) and *Cyprinus carpio* (carp) (Fig. 9). There are no records of these two species having been stocked into waters in East Gippsland (C. Barnham, DCE, pers. comm. 1991). *C. carpio* was recorded from the lower Snowy River in 1971 (Malcolm 1971) but not since then. *C. auratus* has been recorded recently from one site each in the Snowy River and East Gippsland basins (Table 2), the Cann River system representing the eastern range extent of the species in southern Victoria.

Perca fluviatilis (redfin; Fig. 9). Self-sustaining populations of *P. fluviatilis* appear to be restricted to the cooler streams at high elevations in the Snowy River basin, namely the Bendoc, Queensborough and Bonang rivers (Table 2). Between 1950 and 1951 more than 2500 individuals of *P. fluviatilis* were stocked into Butchers Creek (Barnham 1990).

FAUNAL CHARACTERISTICS

Fish assemblages may be termed significant if they possess unique biological or conservation values, such as having an exceptionally high species diversity, containing threatened species or a unique combination of species, or being unaffected by the introduction of exotic species (Maitland 1985). Many sites in East Gippsland contain significant fish assemblages (see below, and Figs 3–9). The fish assemblages in streams east of the Bemm River system, including Dock Inlet and the Yeerung River (Fig. 1), are rated as significant because exotic species are generally absent (Fig. 9; see also Macmillan 1990). Some other sites of particular significance are: the Rodger River at Waratah Flat, containing the largest known population of *Galaxias olidus* in East Gippsland; the Wingan River, containing all four species of *Galaxias* known from East Gippsland; the Little River (Mallacoota Inlet), the only known location for *Potamalosa richmondia* in East Gippsland; Elusive Lake, containing a land-locked population of the normally diadromous *Galaxias truttaceus*; and the Red River, a short coastal stream that is one of the few areas in the state where the non-diadromous species *Galaxias olidus* is found close to the ocean.

Since 1983, 24 pre-logging surveys have been conducted in East Gippsland to identify sites of significant flora and vertebrate fauna or significant habitats (Earl & Lunt 1989; S. Duncan, DCE, pers. comm. 1991). Regrettably no surveys included fishes, and consequently the distribution of significant freshwater fish species or assemblages has not contributed to forest management plans in the region to date.

Ten native fish species recorded from the region are considered threatened in Victoria (Table 3), and three of them, *Potamalosa richmondia, Prototroctes maraena* and *Macquaria novemaculeata*, are listed as threatened species under the Victorian *Flora and Fauna Guarantee Act 1988*. These 10 species represent 71% of the 14 threatened species found in Victorian coastal river basins (Koehn & Morison 1990). More significantly, these 10 species represent 70% of the diadromous species in East Gippsland, hence the importance of maintaining unobstructed instream passage for all stages of their life cycles. Two major rivers (Cann and Wingan) contain five threatened species, one (Snowy River) contains four species, and five systems (Barracoota Lake and Bemm, Brodribb, Buchan and Suggan Buggan rivers) each contain three threatened species. A maximum of three threatened fish species have been recorded from a single site (Figs 3–9).

Species diversity of freshwater native fish in East Gippsland is high, 19 of the 23 species known from coastal Victorian river basins (Koehn & O'Connor 1990b) having been recorded there. All of these 19 species except *Potamalosa richmondia* are found in the Snowy River basin, and all but *P. richmondia* and *Geotria australis* are found in the East Gippsland river basin. Only seven species (*Anguilla australis, A. reinhardtii, Retropinna semoni, Galaxias maculatus, Macquaria novemaculeata,*

Species	Conservation Status	Diadromous
Potamalosa richmondia	Endangered	*
Prototroctes maraena	Vulnerable	*
Geotria australis	Potentially Threatened	*
Galaxias brevipinnis	Potentially Threatened	*
Galaxias truttaceus	Potentially Threatened	*
Macquaria novemaculeata	Potentially Threatened	*
Galaxias olidus	Indeterminate	
Gadopsis marmoratus	Indeterminate	
Gobiomorphus australis	Indeterminate	*
Gobiomorphus coxii	Indeterminate	*
Philypnodon sp. nov.	Uncertain Status	
Mordacia mordax	Common	*
Anguilla australis	Common	*
Anguilla reinhardtii	Common	*
Retropinna semoni	Common	
Galaxias maculatus	Common	*
Nannoperca australis	Common	
Pseudaphritis urvillii	Common	*
Philypnodon grandiceps	Common	

Table 3. Victorian conservation status (from Koehn & Morison 1990) and diadromy (*) of native freshwater fish species recorded from East Gippsland during 1967–1991.

Psendaphritis urvillii and *Philypnodon grandiceps*) have been recorded from the Towamba River basin. On a river system basis, diversity was highest in the Brodribb River (13 native species) followed by the Wingan River (11 species) (Figs 3–9). The Bemm, Betka, Cann and Buchan river systems had 10 species each), and a further six systems (Genoa, Mueller, Red, Yeerung rivers, and Cabbage Tree and Martin creeks) contained seven to nine species each.

Kinhill Engineers (1988), in discussing the depauperate fish fauna in Australian streams, stated that many Victorian native species are now restricted in distribution, and that consequently the number of native species in any given stretch of river is likely to be five or less. Six or more native species were present, however, at 26 sites in East Gippsland (Figs 3-9). One site (Brodribb River near the junction with Sardine Creek) had nine species, four sites (Betka and Wingan rivers and Martin Creek) had eight, 10 sites (Bemm, Betka, Cann, Thurra, Brodribb rivers and B. A., Cabbage Tree and Hospital creeks) had seven, and 11 sites (Wau Wauka Lake, Mueller, Red, Brodribb, Buchan, Suggan Buggan and Rocky rivers and Camp, Martin and Sardine creeks) had six species each.

Abundance data for all fish species at all sites in the three river basins were grouped to provide a gross indication of estimated numerical density during 1967–1991 (Table 2). *Galaxias maculatus, Retropinna semoni* and *Salmo trutta* were the most abundant species (more than 1000 individuals each), followed in decreasing order by *Psendaphritis urvillii, Philypnodon grandiceps, Anguilla reinhardtii, Gadopsis marmoratus, Mordacia mordax, Nannoperca australis* and *Anguilla australis*, with abundances ranging from 446 to 115 individuals. Though *A. australis* was only the tenth most abundant species it was the most widely distributed, indicating that it occurs in low densities. *N. australis, M. mordax, Philypnodon* sp. nov. and *Gobiomorphus australis* were locally abundant but restricted in distribution. All threatened species (Table 3) except *Gadopsis marmoratus* were rare, with abundances of less than 100 individuals each. *S. trutta* is the only exotic species that was abundant and widely distributed; *Carassius auratus* was abundant (10 individuals) at one site only (Hall 1989).

Twelve of the 19 native species recorded from the region are diadromous (Table 3). The dominance of the fish fauna by these species is important in explaining distribution patterns throughout East Gippsland, because only five of the species (*Mordacia mordax, Geotria australis,*

Anguilla australis, A. reinhardtii and *Galaxias brevipinnis*) have the ability to traverse natural or man-made instream barriers (Koehn & O'Connor 1990a). The other seven species have limited or no ability to bypass barriers and may be absent upstream of an obstruction (see Hall 1989).

Of the non-diadromous species in the fauna (Table 3), *Galaxias olidus, Nannoperca australis, Gobiomorphus coxii* and *Philypnodon* sp. nov. are restricted in distribution and relatively low in abundance in East Gippsland. Coupled with their inability to migrate, these species are especially vulnerable because they have little ability to colonise new areas or to recolonise sites after local extinctions have occurred. Entire populations of non-diadromous species may be lost during catastophic events, such as wildfire and its after-effects on aquatic ecosystems (see Pescott 1983), or more gradual degradation of the instream habitat through loss of habitat, competition with exotic species or deteriorating water quality.

Water velocities and gradients, and the availability of suitable habitat, may also act to prevent the upstream movement of diadromous and non-diadromous fish species (Hayes et al. 1989).

The topography of East Gippsland ranges from low elevation, relatively narrow coastal plains, through dissected highlands to mountain areas which contain elevated plateaus in the north-west (LCC 1985, Macmillan 1990). As elevation increased the diversity of native fish species decreased (Table 2): 19 species at 0–100 m; 10 species at 101–400 m; five species at 400–700 m; and only two native species (*Anguilla australis* and *Galaxias olidus*) above 1000 m. Introduced species generally followed a similar pattern, with only *Salmo trutta* found above 1000 m. A similar trend in species diversity was observed by Lake & Fulton (1981), Pusey et al. (1989) and Hayes et al. (1989) in studies on fish assemblages in coastal streams in Tasmania, Western Australia and New Zealand respectively. This trend provides only a general guide to species diversity at particular elevations, because diversity at any locality depends on many factors such as land use, presence of exotic species, the size and depth of the stream, and environmental variables such as water velocity, gradient, depth and substrate (Taylor 1988, Hanchet et al. 1989, Hanchet 1990).

Further survey work in streams at altitudes of 200–800 m may increase the upper ranges where the following species are recorded in East Gippsland: *Geotria australis, Mordacia mordax, Galaxias brevipinnis, G. truttaceus, Nannoperca australis, Gobiomorphus australis, G. coxii, Philypnodon grandiceps* and *Pseudaphritis urvillii*.

DISCUSSION

Sampling of fish in the freshwater habitats of East Gippsland has generally been spasmodic and the overall direction of surveys has been uncoordinated. Information obtained from successive surveys has not necessarily been complementary, so that gaps persist in our knowledge of species distributions. Most surveys have provided only general information on species distributions, and no attempt has been made to elucidate the distribution or habitat preference of fish species at various stages in their life cycles. In addition, no attempt has been made to determine trends in species distributions over time by establishing monitoring sites, a problem identified by the OCE (1989) in native fish research statewide.

Another limitation inherent in the distribution data is that most of the sites surveyed have been at easily accessible points, such as road crossings, where the riparian and instream habitat have been disturbed. It is not known whether fish assemblages at disturbed sites differ from those at unaltered sites; therefore assessments of species diversity or of numerical abundance at disturbed sites may not be reliable.

The distribution maps (Figs 3–9) consequently serve only as a general guide to fish distributions in East Gippsland. Due to the scarcity of data on species distribution in the region before 1967, it is difficult to know how closely the present day distributions mirror those of pre-European settlement, before the advent of land clearing, agriculture, mining and timber harvesting. It is also difficult to evaluate how species abundance and distribution changed with the advent of intensive timber harvesting in the 1960s (LCC 1985). The impact of exotic fish species on the native fish fauna is also unkown.

The distribution maps do, however, provide a benchmark from which to gauge future alterations in species distributions or changes in assemblages at specific sites. Fish are sensitive to changes in the aquatic environment and consequently are good indicators of environmental conditions (OCE 1989), especially those

species resident entirely in fresh water rather than the diadromous species. The maps also highlight the disjunct distribution of the many threatened species of native fish which inhabit the region, as well as those which have reached the limit of their range in East Gippsland.

The species list for East Gippsland (Table 1) may be expanded in the future if more intensive surveys are conducted. For example, the range of *Galaxiella pusilla* (dwarf galaxias) is known to extend to the Gippsland Lakes (Koehn et al. 1991) but may extend farther eastward into East Gippsland. Similarily, the ranges of *Hypseleotris compressa* (Empire gudgeon) and *Hypseleotris galii* (firetailed gudgeon) extend southwards into the New South Wales portion of the Towamba River basin (Llewellyn 1983, Allen 1989) and may extend into East Gippsland. *Mordacia praecox* (non-parasitic lamprey) is known with certainty only from the Tuross and Moruya rivers, south-eastern New South Wales (Allen 1989) but has been tentatively recorded from the La Trobe River system in Victoria (Harasymiw 1986, 1989). Consequently, this species may also be found in East Gippsland.

A notable feature of the fish fauna of East Gippsland is the low abundance (except for *Salmo trutta*) and diversity of exotic fish species, only five of the 12 exotic fish species known from Victorian fresh waters (OCE 1989) being recorded in the region. It is significant that *Gambusia holbrooki* (mosquitofish), widespread throughout Victoria (Cadwallader & Backhouse 1983), is absent from the region. Unconfirmed reports of its presence near Bairnsdale (J. Strong, Fisheries and Wildlife Protection Officer, Bairnsdale Region, pers. comm.) may indicate that the range of this species has expanded eastward from the MacAlister River (Hall 1989) and may extend into East Gippsland in the near future.

The natural significance of East Gippsland, identified by Blyth & Jackson (1985), has been further confirmed by the LCC (1991) which has proposed 10 major rivers and their tributaries as Victorian Heritage rivers, a further two rivers as Representative rivers and 16 catchments as Essentially Natural Catchments. Regrettably, except in the lower Bemm, Thurra and Snowy rivers, the Red and Benedore rivers, and Shipwreck, Easby and Seal creeks, few or no fish surveys have been conducted in these streams (Fig. 2).

There is therefore a pressing need for an immediate increase in coordinated fish survey effort in East Gippsland, with more intensive surveys conducted in more inaccessible reaches of streams and designed to complement existing knowledge of species distributions. The fish assemblages of many streams remain unsurveyed, and those in areas where freshwater habitats are under threat (e.g. forest coupes) should have first priority. Long-term population monitoring of these sites can provide useful data on the impact of the land-use practice on the component aquatic fauna.

Attention should also be directed to consolidating information on the abundance and distribution of threatened species, especially in middle elevation to upland areas of most river systems; to providing information on seasonal influences on the abundance and diversity of fish assemblages; and to the persistence of assemblages over time. The dominance of the native fauna by diadromous species makes it important to include information on the location of instream barriers when interpreting distribution patterns. Information on alterations to catchment land-use are also important as they may affect fish species distributions (Hanchet 1990).

CONCLUSION

Because the natural resources of East Gippsland are being increasingly exploited, information on species distributions and abundances of freshwater fish must be consolidated and enhanced. It must also be recognised that native freshwater fish are relevant to the scientific assessment of significant aquatic systems. Streams containing significant species or assemblages should be monitored for changes in species distributions over time, so that appropriate management strategies can be adopted to safeguard those ecosystems.

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APPENDIX

Location and altitude for eaeh sample site. trib. = unnamed tributary, E = estuarine sites. Map number and grid refcrenee eorrespond to 1:100,000 topographie survey map series.

Site no.	Watercourse	Basin no.	Map no.	Grid ref.	Altitude	
1	Hospital Ck	22	8522	048209	20	
2	Hartland R.	22	8522	123204	15	
3	Corringle L.	22	8522	310175	0	E
4	Beadle L.	22	8522	225163	10	
5	Snowy R.	22	8622	345154	0	E
6	Snowy R. trib.	22	8522	295218	10	
7	Snowy R.	22	8522	279245	5	E
8	Snowy R.	22	8522	230263	10	
9	Snowy R.	22	8522	210293	15	
10	Snowy R.	22	8523	199648	100	
11	Snowy R.	22	8523	190752	100	
12	Snowy R.	22	8523	248941	160	
13	Snowy R.	22	8524	264130	210	
14	Snowy R.	22	8524	268133	210	
15	Buchan R.	22	8522	078481	60	
16	Buchan R.	22	8523	034495	65	
17	Buchan R.	22	8523	034519	80	
18	Buchan R.	22	8523	036530	90	
19	Buchan R.	22	8524	003066	760	
20	Buchan R. trib.	22	8524	973159	1180	
21	Native Dog Ck	22	8524	006171	1320	
22	Moss Bed Ck	22	8523	961900	1030	
23	Murrindal R.	22	8523	085499	180	
24	Butchers Ck	22	8523	119653	320	
25	Butchers Ck	22	8523	118757	620	
26	Wulgulmerang Ck	22	8523	150966	780	
27	Little R.	22	8523	154997	720	
28	Suggan Buggan R.	22	8524	179095	370	
29	Suggan Buggan R.	22	8524	099191	680	
30	Deddick R.	22	8523	278937	200	
31	Bonang R.	22	8623	521888	640	
32	Bonang R.	22	8623	523854	680	
33	Bonang R.	22	8623	535810	680	
34	Bonang R.	22	8623	543805	720	
35	Bonang R.	22	8623	549795	720	
36	Bonang R.	22	8623	560766	820	
37	Rodger R.	22	8523	204588	120	
38	Rodger R.	22	8623	392724	680	
39	Yalmy R.	22	8523	276595	170	
40	Lt. Yalmy R.	22	8623	377627	360	
41	Lt. Yalmy R.	22	8623	410632	440	
42	Serpentine Ck	22	8523	268577	180	
43	Wall Ck	22	8522	264307	60	
44	Major Ck	22	8522	274283	15	
45	Cabbage Tree Ck	22	8622	543211	10	
46	Cabbage Tree Ck	22	8622	555317	145	
47	Curlip L.	22	8622	378205	5	E
48	Brodribb R.	22	8622	359233	5	
49	Brodribb R.	22	8622	383266	10	
50	Brodribb R.	22	8622	389301	15	
51	Brodribb R.	22	8622	388407	80	
52	Brodribb R.	22	8622	357479	90	
53	Brodribb R.	22	8623	488553	190	
54	Brodribb R.	22	8623	489623	220	

Site no.	Watercourse	Basin no.	Map no.	Grid ref.	Altitude	
55	Brodribb R.	22	8623	491631	240	
56	Brodribb R.	22	8623	506663	240	
57	Goongerah Ck	22	8623	509668	260	
58	Goongerah Ck	22	8623	501682	265	
59	Rocky R.	22	8622	428341	60	
60	Rich R.	22	8622	422473	140	
61	O'Connor R.	22	8622	423443	120	
62	Sardine Ck	22	8622	356479	90	
63	Martin Ck	22	8623	375509	140	
64	Martin Ck	22	8623	395536	180	
65	Big R.	22	8623	489552	190	
66	Fern Tree Ck	22	8623	488572	210	
67	Ironbark Ck	22	8623	460593	260	
68	B.A. Ck	22	8623	480585	210	
69	B.A. Ck	22	8623	504613	280	
70	Dead Calf Ck	22	8623	481615	220	
71	Delegate R.	22	8623	594848	860	
72	Bendoc R.	22	8623	764885	780	
73	Bendoc R.	22	8623	669870	960	
74	Queensborough R.	22	8723	797885	800	
75	Back Ck	22	8623	728837	840	
76	Craigie Bog Ck	22	8723	805856	760	
77	Yeerung R.	21	8622	559161	0	E
78	Yeerung R.	21	8622	558196	30	
79	Dock Inlet	21	8622	620167	0	E
80	Sydenham Inlet	21	9722	770168	0	E
81	Sydenham Inlet	21	8622	740180	0	E
82	Bemm R.	21	8622	749205	0	E
83	Bemm R.	21	8622	719215	10	
84	Bemm R.	21	8622	718217	10	
85	Bemm R.	21	8622	700228	15	
86	Bemm R.	21	8622	677358	70	
87	Bemm R.	21	8622	704439	100	
88	Goolengook R.	21	8622	642468	160	
89	Combienbar R.	21	8623	754544	200	
90	Combienbar R.	21	8723	802644	360	
91	Errinundra R.	21	8623	673594	200	
92	Ada R.	21	8623	674585	200	
93	Mud L.	21	8722	770185	0	E
94	Swan L. Channel	21	8722	770200	5	E
95	Swan L.	21	8722	786207	5	E
96	Swan L. trib.	21	8722	801221	10	E
97	Tamboon Inlet	21	8722	887166	0	E
98	Tamboon Inlet	21	8722	870200	0	E
99	Camp Ck	21	8722	863202	0	E
100	Furnell L.	21	8722	860231	10	E
101	Cann R.	21	8722	877304	50	
102	Cann R.	21	8723	947559	130	
103	Cann R.	21	8723	948615	160	
104	Cann R.	21	8723	903700	320	
105	Buldah Ck	21	8723	904725	340	
106	Fiddlers Green Ck	21	8723	948615	160	
107	Tonghi Ck	21	8722	854347	60	
108	Thurra R.	21	8722	018161	0	
109	Thurra R.	21	8722	991221	20	
110	Thurra R.	21	8722	975280	60	
111	Mueller R.	21	8722	046164	0	E
112	Mueller R.	21	8722	045181	0	E
113	Mueller R.	21	8722	042205	10	

Site no.	Watercourse	Basin no.	Map no.	Grid ref.	Altitude	
114	Mueller R.	21	8722	036278	110	
115	Elusive L.	21	8722	153194	40	
116	Wingan Inlet	21	8822	212193	0	E
117	Wingan R.	21	8722	197236	0	E
118	Wingan R.	21	8722	196237	10	E
119	Wingan R.	21	8722	197254	40	
120	Wingan R.	21	8722	186336	70	
121	Wingan R.	21	8723	142503	160	
122	Wingan R. trib.	21	8722	190350	80	
123	Hard To Seek Ck	21	8822	217344	80	
124	Easby Ck trib.	21	8822	235218	60	
125	Red R.	21	8822	260218	0	
126	Red R.	21	8822	259274	100	
127	Red R. trib.	21	8822	271267	80	
128	Benedore R.	21	8822	310245	5	E
129	Seal Ck	21	8822	364278	0	E
130	Shipwreck Ck	21	8822	381296	0	E
131	Shipwreck Ck	21	8822	373297	20	
132	Betka R.	21	8822	420370	0	E
133	Betka R.	21	8822	400362	0	E
134	Betka R.	21	8822	372368	20	
135	Betka R.	21	8822	328352	50	
136	Sheep Station Ck	21	8822	400380	40	
137	Davis Ck	21	8822	428380	10	E
138	Mallacoota Inlet	21	8822	440420	0	E
139	Mallacoota Inlet	21	8822	470420	0	E
140	Mallacoota Inlet	21	8822	414435	0	E
141	Genoa R.	21	8823	363488	0	E
142	Genoa R.	21	8823	321485	5	E
143	Genoa R.	21	8823	290492	20	E
144	Genoa R.	21	8723	187596	100	
145	Maramingo Ck	21	8823	335507	20	E
146	Maramingo Ck	21	8823	333524	20	E
147	Wallagaraugh R.	21	8823	382523	5	E
148	Wallagaraugh R.	21	8823	403555	5	
149	Little R.	21	8823	452468	0	E
150	Dowell Ck	21	8823	478489	15	
151	Harrison Ck	21	8823	492481	20	
152	Barracoota L.	21	8822	525415	5	
153	Wau Wauka L.	20	8822	587445	5	